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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/540,733	07/27/2005	Poopathy Kathirgamanathan	LUC-014	9157

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EXAMINER
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NELSON, MICHAEL E

ART UNIT	PAPER NUMBER
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1794

MAIL DATE	DELIVERY MODE
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05/15/2008

PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/540,733	<b>Applicant(s)</b> KATHIRGAMANATHAN ET AL.	
	<b>Examiner</b> MICHAEL E. NELSON	<b>Art Unit</b> 1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 24 June 2005.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 48-73 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 48-73 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 June 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>07/18/2005</u> .  | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Claim Objections***

1. Claims 69-73 are objected to because of the following informalities:
2. Claims 69-73 all depend directly or indirectly from claim 60. Given the claim construction, it appears that they are intended to be dependent from claim 61. Please verify and correct if necessary.
3. Appropriate correction is required.
4. Claim 73 is objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim. Applicant is required to cancel the claim(s), or amend the claim(s) to place the claim(s) in proper dependent form, or rewrite the claim(s) in independent form. Claim 73 depends from claim 60, but claims the identical limitations.

### ***Claim Rejections - 35 USC § 112***

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:  

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
6. Claims 54-55, 61-68 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
7. Claim 61 states (ii) a layer of an electroluminescent europium metal complex or organometallic complex mixed with an iridium metal complex or organometallic

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complex. It is unclear whether the organometallic complex is also Europium or Iridium, or whether the organometallic complex can be any organometallic complex. Claims 62-63 are likewise unclear. Claim 64 indicates that the organometallic complex also has Eu, and given the information in the specification, it seems that the claim should read "europium metal complex or europium organometallic complex." A similar correction could be made for iridium.

8. Claims 54 and 55 both state, "wherein the metal in the complex is (europium or gadolinium) and the complex is (specific Eu or Gd complex)." However, both claims depend from claim 52, which ultimately depends from claim 48, which requires **two** metal complexes. It is unclear **which** metal complex is required to be Europium in claim 54, and which is required to be gadolinium in claim 55). Based on claim 50, it appears that the first metal complex should be europium, and the second should be gadolinium.

### ***Claim Rejections - 35 USC § 102***

9. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

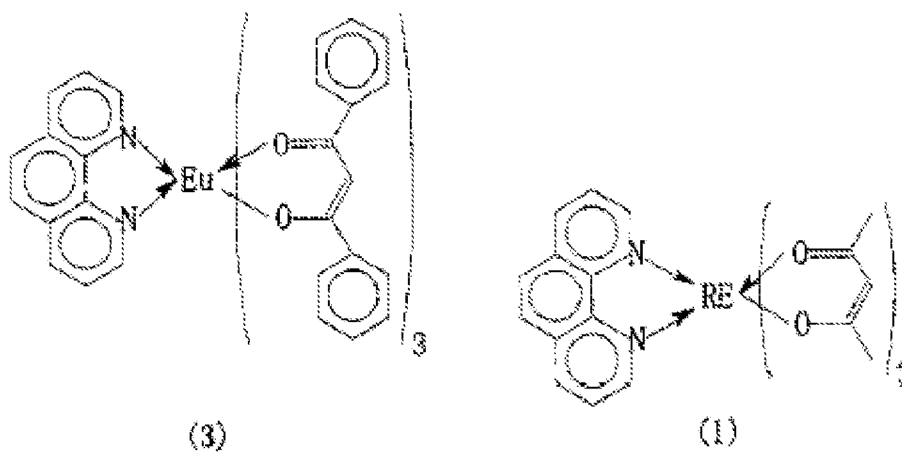
(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

10. Claims 48-53, 60 and 73 are rejected under 35 U.S.C. 102(b) as being anticipated by Hong et al. (Synthetic Metals, vol. 91, pp. 271-273, 1997).

11. Concerning claims 48-53, 60 and 73, Hong et al. disclose an organic electroluminescent device comprising a first electrode (of ITO), and a second electrode

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(of Aluminum, per claims 60 and 73), and a layer of a first electroluminescent organometallic complex, which is a Europium complex having the structure (3) shown below (per claims 49-53), and the second layer comprises an organometallic complex which is a gadolinium complex having the structure (1, where RE is Gd) shown below (per claims 49-53), where the bandgap of the gadolinium complex is inherently larger than the bandgap of the europium complex (as evidenced by the specification on page 3, which states that europium complexes are red emitters (low bandgap), and gadolinium complexes are ultraviolet emitters (high bandgap)).



12. Concerning claims 51-53, the compounds above are organometallic complexes having the formula  $(L\alpha)_x Mx \text{---} Lp$ , where  $L\alpha$  is dibenzoylmethane in the case of the europium complex, and acetoacetate in the case of the gadolinium complex (both diketones, per structure (I), claim 52), M is either europium (III) or gadolinium (III),  $x=3$ , and Lp is phenanthroline (structure XIV, per claim 53).

***Claim Rejections - 35 USC § 103***

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claim 54 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al. (Synthetic Metals, vol. 91, pp. 271-273, 1997) as applied to claim 52 above, and further in view of Kathirgamanathan (WO 9858037).

15. Concerning claim 54, Hong et al. describe an electroluminescent device discussed above, where the light emitting material is a europium complex. Hong et al. are silent on the use of the specific complex  $\text{Eu}(\text{DBM})_3\text{OPNP}$ .

16. Kathirgamanathan describe electroluminescent materials having very high photoluminescent efficiency compared with europium phenanthroline complexes. Kathirgamanathan describes the specific Europium complex (example 6, page 9), and reports a photoluminescent efficiency of 90% (table 1, page 14), and an electroluminescent device comprising the europium material with very high brightness and efficiency (Table 2, page 15).

17. Given this teaching, and the close similarity in structure, it would have been obvious to one of ordinary skill to use the europium complex described by Kathirgamanathan in the electroluminescent device described by Hong et al. for the purpose of producing an electroluminescent device with high brightness and efficiency using a material with a very high photoluminescent efficiency. Given the close similarity

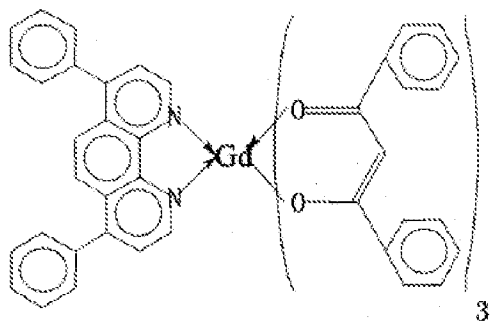
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in structure, and the fact that Kathirgamanathan teaches the use of the material in electroluminescent devices, the material would be predicted to function as a light emitting material.

18. Claim 55 rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al. (Synthetic Metals, vol. 91, pp. 271-273, 1997) as applied to claim 52 above, with evidence provided by Liang et al. (Thin solid films, vol. 371, pp. 207-210, 2000).

19. Concerning claim 54, Hong et al. describe an electroluminescent device discussed above, where the light emitting material is a europium complex and the electron transporting material is a gadolinium complex. Hong et al. are silent on the use of the specific complex  $\text{Gd}(\text{DBM})_3\text{Phen}$ .

20. Liang et al. describe organic electroluminescence devices using  $\text{Gd}(\text{DBM})_3\text{bath}$  (shown below) and disclose that while the material produces exciplex emission with TDP, it also functions as an electron transporting material. (page 208) This indicates that the dibenzoylmethane (DBM) ligand does not change the nature of function of the material as an electron transport material.



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21. Given this teaching, it would have been obvious to one of ordinary skill in the art to use a gadolinium complex with a dibenzoylmethane ligand as an electron transporting material, as described by Hong et al. since the material would be predicted to function as an electron transport material in the electroluminescent device.

22. Claims 56-57, 69-70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al. (Synthetic Metals, vol. 91, pp. 271-273, 1997) as applied to claim 48 and 60 above, and further in view of Yang (5,723,873).

23. Concerning claims 56-57, 69-70, Hong et al. describe an electroluminescent device discussed above, where the light emitting material is a europium complex and the electron transporting material is a gadolinium complex. Hong et al. are silent on the use of a hole transmitting material positioned between the first electrode and the electroluminescent layer.

24. Yang et al. describe organic electroluminescent devices which further include a hole transporting (buffer layer) layer of polyaniline (110) (per claim 57) between the inorganic electrode (ITO) (112), and the light emitting layer (102). (Fig. 2) Yang discloses that the combination of polyaniline with an ITO electrode results in devices with significantly improved performance including lower operating voltages and higher quantum efficiencies (column 2, line 55-column 3, line 25).

25. Given this teaching, it would have been obvious to one of ordinary skill in the art to use the polyaniline layer described by Yang et al. between the light emitting layer and the first electrode in the device described by Hong et al. for the purpose of improving



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the performance of the device, resulting in lower operating voltages and higher quantum efficiencies.

26. Claims 58-59, 71-72 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hong et al. (Synthetic Metals, vol. 91, pp. 271-273, 1997) as applied to claim 48 and 60 above, and further in view of Endo et al. (Japanese Journal of Applied Physics, vol. 41, pp. L800-L803, 2002).

27. Concerning claims 58-59, and 71-72, Hong et al. describe an electroluminescent device discussed above, where the light emitting material is a europium complex and the electron transporting material is a gadolinium complex. Hong et al. are silent on the use of an electron transmitting material between the electroluminescent compound layer and the second electrode.

28. Endo et al. describe organic electroluminescent devices having metal complexes as the cathode interface layer. Endo et al. teach that the use of metal complexes, such as metal quinolates, such as lithium quinolate (Liq, per claim 59) and Liq doped Aluminum quinolate ( $\text{Alq}_3$ ), adjacent to an aluminum cathode (such as the one described by Hong et al.), result in improved performance and improved electron injection from the cathode resulting in lower drive voltages and higher luminance (page L802).

29. Given this teaching, it would have been obvious to one of ordinary skill in the art to use a layer of Liq or a mixed layer of Liq and  $\text{Alq}_3$  adjacent to the Aluminum cathode

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in the device described by Hong et al. for the purpose of reducing the driving voltage and increasing luminance.

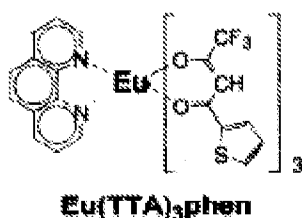
30. Claims 61-67 rejected under 35 U.S.C. 103(a) as being unpatentable over D'Andrade et al. (WO 02091814) in view of Adachi et al. (Journal of Applied Physics, vol. 87, no. 11, pp. 8049-8055, 2000).

31. Concerning claims 61-67 D'Andrade et al. describe organic light emitting devices doped with multiple light emitting dopants, at least dopant comprising a phosphorescent emitter, in a thin film emissive layer or layers. (abstract) The device comprises an anode (first electrode) and cathode (second electrode) and a luminescent layer. (see figure 5) The luminescent region may include a plurality of phosphorescent dopants, mixed in the same region of the luminescent region, provided that the host is selected to reduce cascade energy transfer, and the band thickness and concentration for each dopant is selected such that a desired color of light is emitted from the electrophosphorescent device. (page 18, lines 4-9) D'Andrade et al. disclose that emissive region with a plurality of dopants can be tuned to produce any color of light, including white light (column 10, lines 22-23). D'Andrade et al. disclose that the phosphorescent materials for use in the present device are typically organometallic compounds (page 11, lines 27-29), and give specific examples of compounds with blue, red and green Iridium compounds (page 21, line 30-page 22, line 5). Carbazole-biphenyl (CBP) is mentioned as a suitable host material. (page 21, line 30-page 22, line

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5). D'Andrade et al. are silent on the use of Europium complexes in the light emitting device.

32. Adachi et al. describe organic electroluminescent devices based on triplet emission (phosphorescence) of Europium chelated materials  $\text{Eu}(\text{TTA})_3\text{phen}$  (shown below, per claims 65-67) doped into CBP to produce red electroluminescence).



33. Given this teaching, it would have been obvious to one of ordinary skill in the art to mix the europium complex described by Adachi et al. with the iridium materials described by D'Andrade et al., since it is known to function as a red light emitting material when doped into CBP for the purpose of modulating the color of the emission by mixing the emission color of two different materials, based upon the teaching by D'Andrade et al.

34. Concerning claims 62-63, D'Andrade et al. disclose that the light emitting region can comprise more than one band, where doped regions may overlap, or where a doped region with one phosphorescent dopant may be contained within its entirety within the doped region of another phosphorescent dopant (page 16, lines 15-21), and that the use of multiple layers can achieve a number of benefits, improving overall device efficiency. (page 16, lines 20-21) Given this teaching, it would have been obvious to one of ordinary skill in the art to include a doped region comprising the

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Europium complex alone on either side of the layer comprising the mixture of iridium and europium complex for the purpose of optimizing the color blending or improve the overall efficiency.

35. Claim 68 is rejected under 35 U.S.C. 103(a) as being unpatentable over D'Andrade et al. (WO 02091814) and Adachi et al. (Journal of Applied Physics, vol. 87, no. 11, pp. 8049-8055, 2000) as applied to claim 65 above, and further in view of Kathirgamanathan (WO 9858037).

36. Concerning claim 68, D'Andrade et al. and Adachi et al. describe the organic electroluminescent device with a light emitting layer comprising a mixture of a europium organometallic complex and an iridium organometallic complex, as discussed above. They are silent on the use of the specific europium organometallic complex,  $\text{Eu}(\text{DBM})_3\text{OPNP}$ .

37. Kathirgamanathan describe electroluminescent materials having very high photoluminescent efficiency compared with europium phenanthroline complexes. Kathirgamanathan describes the specific Europium complex (example 6, page 9), and reports a photoluminescent efficiency of 90% (table 1, page 14), and an electroluminescent device comprising the europium material with very high brightness and efficiency (Table 2, page 15).

38. Given this teaching, and the close similarity in structure, it would have been obvious to one of ordinary skill to use the europium complex described by Kathirgamanathan in the electroluminescent device described by D'Andrade et al. and

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Adachi et al. for the purpose of producing an electroluminescent device with high brightness and efficiency using a material with a very high photoluminescent efficiency. Given the close similarity in structure, and the fact that Kathirgamanathan teaches the use of the material in electroluminescent devices, the material would be predicted to function as a light emitting material.

### ***Double Patenting***

39. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

40. Claims 61, 64-68 provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 36, 38-41 of copending Application No. 10/540732. Although the conflicting claims are not identical,

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they are not patentably distinct from each other because Application No. 10/540732 claims an electroluminescent device comprising a first electrode and a second electrode, and a layer of a diiridium compound mixed with a europium complex, where the europium complex is identical to the material of the present claims (claims 68-41). The claims are limited to diiridium compounds, but given the broad nature of the present claims (an iridium metal complex), it is clear that the present claims are not limited, and therefore one of ordinary skill would arrive at the present claims from the copending claims.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Claims 61, 64-68 are directed to an invention not patentably distinct from claims 36, 38-41 of commonly assigned Application No. 10/540732. See discussion above.

The U.S. Patent and Trademark Office normally will not institute an interference between applications or a patent and an application of common ownership (see MPEP Chapter 2300). Commonly assigned Application No. 10/540732, discussed above, would form the basis for a rejection of the noted claims under 35 U.S.C. 103(a) if the commonly assigned case qualifies as prior art under 35 U.S.C. 102(e), (f) or (g) and the conflicting inventions were not commonly owned at the time the invention in this application was made. In order for the examiner to resolve this issue, the assignee can, under 35 U.S.C. 103(c) and 37 CFR 1.78(c), either show that the conflicting inventions were commonly owned at the time the invention in this application was made, or name the prior inventor of the conflicting subject matter.

A showing that the inventions were commonly owned at the time the invention in this application was made will preclude a rejection under 35 U.S.C. 103(a) based upon the commonly assigned case as a reference under 35 U.S.C. 102(f) or (g), or 35 U.S.C. 102(e) for applications pending on or after December 10, 2004.

### ***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to MICHAEL E. NELSON whose telephone number is (571)270-3453. The examiner can normally be reached on M-F 7:30am-5:00pm EST (First Friday Off).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho can be reached on 571-272-1123. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Michael E. Nelson  
Examiner  
Art Unit 1794

/Callie E. Shosho/

Supervisory Patent Examiner, Art Unit 1794